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Limitations of Technical Approaches to Transport Planning Practice in Two Cases: Social Issues as a Critical Component of Urban Projects

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ABSTRACT

Technical transport models are commonly relied upon in planning practice for the development of urban rail infrastructure projects. By considering the assessment and management of social impacts in the planning and decision-making of two rail megaprojects (the North-South Metro line in Amsterdam, the Netherlands, and the Parramatta Rail Link in Sydney, Australia), we found that technical approaches continued to overlook social impacts, and had an overemphasis on economic and engineering considerations. We conclude that good practice Social Impact Assessment (SIA) offers opportunities to better consider social issues as a critical component of transport projects.

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Social impact assessment; environmental impact assessment; urban planning; transport planning; megaprojects; urban geography

Introduction

Urban rail transport projects have a rich history in shaping the spatial patterns of society in cities (Bertolini & Spit, 1998; Clark, 1958; Kellett, 1963; Legacy, 2017; Pulido, Darido, Munoz-Raskin, & Moody, 2018). The 1960s and 1970s saw quantitative modelling techniques become the dominant approach for analysing large-scale transport patterns under different demographic and economic conditions (Banister, 1994; Johnston, Gregory, Pratt, & Watts, 2000). By the 1980s, transport planners were being criticised for the over-application of quantitative approaches and for a lack of behavioural and social analyses (Johnston et al., 2000). However, current transport planning practice continues to be primarily based on quantitative approaches (Jones & Lucas, 2012; Legacy, 2017). Identified as 'predict and provide', 'point to point', or 'line-oriented', these design approaches often ignore wider social contexts (Bertolini, 2012; Beukers, Bertolini, & Te Brömmelstroet, 2012; Heeres, Tillema, & Arts, 2012; Owens, 1995).

Studying the transport patterns of people using quantitative modelling techniques requires analysis using large datasets (Banister, 1994; Johnston et al., 2000). Applied during the early strategic and project planning phases, the metrics of these techniques often lead to decision-making being based solely on the technical outputs from these models, without any consultation of impacted people. Consequently, people's interests, preferences, and how they will likely be impacted are overlooked. Various authors have argued for a shift towards wider, area-oriented, integrated urban development planning practice, towards more flexible, deliberative governance modes, which would open opportunities for better inclusion of social aspects in transport planning practice

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(Bertolini, 2012; Bertolini, Le Clercq, & Straatemeier, 2008; Heeres et al., 2012; Legacy, 2012; Pulido et al., 2018; Woltjer, Alexander, Hull, & Ruth, 2015). Transport planners and engineers face growing pressure to include sustainability and social issues when addressing transport problems and in urban mobility planning (Arts & Faith-Ell, 2012; Banister, 2008; Bertolini, Le Clercq, & Kapoen, 2005; European Commission, 2019; Jones & Lucas, 2012).

Social Impact Assessment (SIA) is a process that can be applied to manage social issues and reconceptualise how social impacts are considered in planning and decision-making about developments (Esteves, Franks, & Vanclay, 2012; Vanclay, 2003). SIA is a well-established field of research and practice (Esteves et al., 2012) supported by international guidelines (see Kwam, 2018; Vanclay, Esteves, Aucamp, & Franks, 2015). It can provide an understanding of the social impacts of urban linear projects, recognising that social impacts are spatially and socially distributed (Pulido et al., 2018). Although the benefits of SIA are well-known (Esteves et al., 2012), there is much room for improvement in how public authorities, project developers and communities use SIA, as social issues tend to be regarded as less important than engineering, economic and environmental considerations (Ferrary & Banerjee, 2017; O'Faircheallaigh, 1999; Vanclay & Esteves, 2011). The continued neglect of the consideration of social risk has the potential to undermine the success and sustainability of projects (Arts & Faith-Ell, 2012; Esteves, Factor, Vanclay, Götzmann, & Moreiro, 2017; Esteves et al., 2012).

The purpose of this paper is to highlight the ongoing limitations of the technical approaches that are applied in transport planning practice, and to consider how best to assess and manage the social impacts of large infrastructure projects. Using qualitative analysis, we draw on the transport planning and SIA literature, insights from impact assessment (IA) practitioners, and lessons learned from two megaprojects: the North-South Metro Line (NZL for *Noord-Zuid Metrolijn*) in Amsterdam, The Netherlands; and the Parramatta Rail Link (PRL) in Sydney, Australia. We suggest that SIA offers an effective approach to consider social issues as a critical component of urban transport infrastructure projects.

Social Impacts and Transport Planning

Social Impacts

In response to the growing sustainability and urban mobility agendas, transport planning practice has increasingly included the evaluation of social impacts in assessments of transport projects (Annema, 2013; Arts & Faith-Ell, 2012; Banister, 2008; Bertolini, 2012; European Commission, 2019; Geurs, Boon, & Van Wee, 2009; Jones & Lucas, 2012). However, the understanding of social impacts, how they should be assessed and addressed, is still highly variable in the planning profession (Grieco & Urry, 2016; Jones & Lucas, 2012).

The International Guidelines for SIA (Vanclay et al., 2015) considers social impacts to be any issue directly or indirectly associated with a project or plan that affects impacted local people or other stakeholders who have an interest in the project. In the case of transport infrastructure, those impacted can extend to the population of an entire city, its surrounds, and beyond. Urban rail transport projects have many social consequences, both directly and indirectly created (Pulido et al., 2018). These can be positive (e.g. enhanced accessibility to employment) or negative (e.g. property expropriation) (Vanclay, 2017a; Vanclay et al., 2015). Impacts vary across projects, are geographically specific, and are affected by the characteristics of the impacted communities (Vanclay, 2002).

Social impacts can arise from a single project, or cumulatively from multiple sources over time or at the same time (Geurs et al., 2009; Jones & Lucas, 2012; Tricker, 2007). Impacts are both behavioural/physiological as well as subjective/psychological in nature, with effects ranging from the individual to society (Jones & Lucas, 2012; Vanclay, 2002). There is a temporal dimension in that impacts can be short or long term in duration, and may change over time. The temporality of infrastructure is important, as the degree and direction of spatial development changes spatial patterns of working and living which in turn generates social and political impacts (Anand, Gupta, & Appel, 2018). When considering how impacts are measured, the SIA and transport planning disciplines acknowledge that the indicators used tend to be linked to policy goals, appraisal guidelines and the methodologies adopted (Jones & Lucas, 2012). Quantitative socio-economic indicators alone rarely accurately capture the complex, dynamic and differentiated nature of social impacts (Vanclay, 2015).

Rail, and linear transport infrastructure projects more generally, often face complex challenges in stakeholder engagement and environmental management (Hamersma, Heinen, Tillema, & Arts, 2018; Howitt & Jackson, 2000). The spatial distribution of impacts experienced along routes and around nodes requires consideration of a wide range of social and environmental issues. Projects often directly impact individuals and communities through location-specific issues (e.g. traffic, noise, vibration, visual amenity, land acquisition, property value appreciation-depreciation, and land-use change). Social issues also include concerns about accessibility, mobility, inclusion-exclusion, inequality, community health, wellbeing, and employment (Vanclay, 2002). These issues are complex to assess because they affect different groups along a route in different ways, and require a variety of methods to evaluate them (Hamersma et al., 2018). Moreover, project impacts may be affected by a range of issues other than the project (Howitt & Jackson, 2000; Schwanen et al., 2015). Some important social impacts play across different geographical scales, from local site-based impacts to suburb, city and regional scales. New patterns of transport connections prompt new behaviours, opportunities, markets and responses. This complexity influences how impacts can be managed, and creates difficulties in establishing the 'zone of impact' or 'study area' for assessment (Esteves et al., 2017; Vanclay & Esteves, 2015).

Various transport planning authors (Geurs et al., 2009; Jones & Lucas, 2012; Lucas & Markovich, 2011) have argued that social impacts are under-considered in *ex-ante* assessments in comparison to engineering, environmental and economic impacts, which are regarded as easier to identify and quantify. Emphasis on cost-benefit analysis as the standard decision-making tool has encouraged use of quantitative assessment approaches (Beukers et al., 2012) requiring considerable data about the performance of the transport system and user behaviour (Geurs & Van Wee, 2004; Jones, Moura, & Domingos, 2014; Schwanen et al., 2015). Model outputs tend to report accessibility and system performance, and are considered central to urban and transport planning, particularly for making comparisons between design alternatives, cities, regions and time periods (Ross, 2000; Stolp, Groen, van Vliet, & Vanclay, 2002).

Typical policy objectives in transport planning seek to address the accessibility and mobility needs of urban societies (Annema, 2013; Legacy, Curtis, & Scheurer, 2017; Ross, 2000). Accessibility is commonly regarded as a social goal of both policy and transport projects (Jones & Lucas, 2012). Jones and Lucas (2012) defined accessibility as the degree to which the goods and services necessary for daily life can be physically accessed. To measure how accessibility is likely to be affected by a planned project, assessments rely on the modelled capability of the transport system, rather than drawing from an understanding of the actual behaviour of the system (Jones & Lucas, 2012).

Mobility, or 'ease of movement' within the transport system, is also a key social goal of transport planning, as it is linked to the wellbeing of residents, their social connectivity, their ability to participate in society, as well as engineering design (Ferrary & Banerjee, 2017; Jones & Lucas, 2012). Urban mobility enhances individual freedom, social connections and economic opportunities (Bertolini, 2012). To fully understand the nature of contemporary urban mobility, Bertolini (2012) argued that social science perspectives are needed in transport planning. Martens (2017) was particularly critical of traditional transport planning models, suggesting that the solutions they provide systematically ignore how people are differentially affected. However, this poses challenges for the discipline, as understanding the temporality and dynamics of social issues requires qualitative methods (Schwanen et al., 2015).

In justifying public transport projects, project advocates promote economic benefits over the alleged social benefits (Steele & Legacy, 2017). While the intended benefits (e.g. improved accessibility and connectivity) may be positive for some (especially at aggregate level), this may be at the expense of others who experience negative impacts, leading to an inequitable outcome. Commonly-applied transport planning methods have limited capability to address distributional effects, yet distributional issues tend to generate the most public attention in transport projects (Bertolini, 2012; Jones & Lucas, 2012). Geurs et al. (2009) further suggested that transport research fails to consider the equitable distribution of benefits and costs across populations and regions. Sheller's (2018) work on mobility justice also proposed a wider lens for transport planning, so that it will capture the distribution of effects across urban space. She called for participation, deliberation, recognition and procedural fairness in decision-making in order to understand the politics of uneven mobilities and fair access to transport. Sheller (2018) also argued that the political decision making about the technicalities of transport projects must consider historical, social and environmental relations as well as wider global relations, to achieve mobility justice.

The Role of Social Impact Assessment

Good SIA practice recognises that technical quantitative approaches are inadequate in capturing distributional issues and can misrepresent complex social problems (Arce-Gomez, Donovan, & Bedggood, 2015; Becker, Harris, Nielsen, & McLaughlin, 2004). The inappropriate application of technical quantitative approaches may politicise community participation, reinforce inequality and inequitable decisions, and misrepresent project outcomes which falsely justify the project (Gagnon, Hirsch, & Howitt, 1993; Howitt, 1993). To facilitate the fair and proper assessment of social impacts, Jones and Lucas (2012) and Stanley and Vella-Brodrick (2009) argue that a more integrated and people-centred approach to social policy and transport development is needed, which we suggest can be provided by SIA.

SIA is a field of research and practice that considers the processes of assessment and management of social impacts and changes at all spatial scales and across the project life-cycle (Howitt, 2011; Vanclay et al., 2015). Its philosophical and theoretical traditions lie within the social sciences, drawing on interdisciplinary thinking from fields such as sociology, anthropology, community psychology and human geography (Esteves et al., 2012). SIA provides a framework for understanding and addressing stakeholders and institutions in a social context, facilitating engagement with contemporary social science concepts such as power, place, culture, sustainability, scale, community, participation and equity (Howitt, 2011). The understanding of social issues is developed by: drawing upon different social theories relevant to the information gathered in empirical research;

engagement with affected communities and other stakeholders; and appreciating their relationships with places and each other (Howitt, 2011; Vanclay, 2003; Vanclay et al., 2015).

The International Guidelines for SIA (Vanclay et al., 2015) refer to SIA as being a process that seeks to manage social impacts throughout the whole project lifecycle. In a regulatory context, SIA aligns with EIA (Environmental Impact Assessment), but often acts as a management tool in project design (Franks & Vanclay, 2013). SIA is often undertaken in wider investigations (such as Environmental, Social and Health impact assessments that are common in large projects), but can also be undertaken as a standalone exercise (Esteves et al., 2012). SIA identifies the affected stakeholders, likely impacts and their potential significance, as well as mitigation and control measures to reduce the severity of negative impacts, and actions to enhance the positive benefits of projects (Esteves & Vanclay, 2009; Vanclay, 2002, 2003). Good SIA practice requires effective stakeholder consultation to scope impacts, and engage and empower impacted people, especially vulnerable and marginalised groups (Gagnon et al., 1993; O'Faircheallaigh, 1999, 2010; Vanclay et al., 2015). Stakeholder engagement practices in SIA apply ethical social research methods, engaging communities prior to a decision (to *inform* that decision) (Gagnon et al., 1993; Vanclay, Baines, & Taylor, 2013; Vanclay et al., 2015). Empowering the participation of those marginalised, due to unequal societal power relations, helps to include a fairer representation of voices in decision-making. This early engagement aids project knowledge and understanding of how citizens feel about the potential development, the state of their living environment, and how the project can be modified to improve outcomes (Stolp et al., 2002). It also provides a mechanism to identify design or development alternatives and potential conflicts early on, and to negotiate an agreeable outcome with stakeholders (Gagnon et al., 1993; Miller & Buys, 2012).

Other widely recognised benefits of SIA, relevant to project planning, include: the early identification of social issues (and thus reduction in costs); avoiding and reducing social and environmental risks and conflicts; facilitating mediation (negotiation); ensuring social justice, enhanced social performance and the positive legacy of projects; informing stakeholders; building trust through better communication; and improved planning for physical and social infrastructure (Esteves et al., 2017, 2012; Franks & Vanclay, 2013; Miller & Buys, 2012; Vanclay, 2017a; Vanclay et al., 2015).

Once impacts are identified and assessed, an important good practice aspect of undertaking SIA involves developing management strategies and monitoring follow-up (Franks & Vanclay, 2013; Storey & Noble, 2005). The development of strategies should initially involve the preparation of a Social Impact Management Plan (SIMP) (Franks & Vanclay, 2013). Good practice SIA and EIA adopt an adaptive management approach to developing strategies and use follow-up throughout the project life-cycle to respond proactively to changes during project implementation (Esteves et al., 2012; Franks & Vanclay, 2013). Follow-up evaluation is part of the EIA process and includes four elements: monitoring, evaluation, management, and communication of post-decision activities (Morrison-Saunders & Arts, 2004). However, follow-up may also occur independently of EIA, being required by regulation (such as through permits) to manage project performance and ensure environmental and social outcomes, or established in corporate policy or the project's environmental management system (Carruthers & Vanclay, 2007; Morrison-Saunders, Baker, & Arts, 2003).

In public infrastructure planning, stakeholders call for transparency in government spending and in how risks are assessed and managed (Cantarelli & Flyvbjerg, 2013; Esteves et al., 2017). Public participation is a key approach in urban planning processes, helping governments maintain transparency and legitimacy, and encouraging accountability where the public are given power to influence decision-making processes (Hartley & Wood, 2005; O'Faircheallaigh, 2010; Ruming,

2019). However, as Haughton and McManus (2019) identified, the contribution of public participation to urban planning can be easily curtailed by the politics of a neoliberal planning agenda, generating dissatisfaction and conflict. An erosion of trust in government is a key social risk in transport planning that can undermine project success and lead to a loss of social licence to operate (Esteves et al., 2017, 2012; Hanna, Vanclay, Langdon, & Arts, 2016; Haughton & McManus, 2019; Vanclay & Hanna, 2019). The social licence to operate of a project (i.e. the level of acceptance by affected stakeholders and communities) influences whether it is likely to proceed or encounter protest and opposition (Boutilier, 2014; Dare, Schirmer, & Vanclay, 2014; Hanna et al., 2016). There is a tendency for governments to assume that a social licence exists through democratic processes and does not need to be acquired, and that it cannot be lost or diminished (Jijelava & Vanclay, 2018; Parsons & Moffat, 2014). Social licence is an important consideration in community participation and engagement in SIA, which governments can use to help them engage with public needs and concerns during transport planning and to understand how and when a social license might occur (Dare et al., 2014).

Transport Megaprojects

Big linear transport infrastructure projects are transformative and city-shaping. They are agents of social change, and are often regarded as megaprojects (Priemus, Bosch-Redveldt, & Giezen, 2013; Vanclay, 2017b). Megaprojects are transformational, large-scale, long-term, costly, complex ventures that involve multiple stakeholders, often with contradictory interests (Flyvbjerg, 2014). Infrastructure projects are technically complex, and also politically and socially complex and contested (Vanclay, 2017b). Lessard and Miller (2013) identify six stages in decision-making around megaprojects: shaping the opportunity; shaping the project; reshaping the project; engineering the project; preparing to build the project; and ramping up operations. Put another way, megaprojects begin as a vision, progress through project design, tender and assessment, and then to build and operation. As each stage progresses, technical expertise and stakeholder input should be incorporated to iteratively shape the project and inform decision-making (Priemus & Van Wee, 2013).

Using this understanding of megaprojects to structure our analysis, our findings contribute to the fields of transport planning and SIA. Our discussion of the two cases highlights how a narrow focus on technical concerns in early project stages leads to social issues being overlooked in later stages. Our findings complement existing discussions within the transport planning literature about the limitations of technical approaches to evaluating social issues. Our evidence also contributes to the fundamental need for a shift in thinking in transport planning practice, from a reliance on technical approaches to more deliberative and qualitative methods. We advocate for the application of good practice SIA in urban transport planning to better consider social issues as a critical component of projects.

Methodology and Background to the Cases

In this paper, we consider two urban rail infrastructure projects: the North-South Metro Line (*Noord-Zuid MetroLijn)* (NZL) in Amsterdam, the Netherlands; and the Parramatta Rail Link (PRL) in Sydney, Australia. These projects were selected by us because they were megaprojects that were evaluated by decision-makers using a technical modelling approach, and were located in countries with established EIA processes. Both projects aimed to resolve traffic congestion and achieve significant

benefits for society. We specifically looked at how social impacts were considered, evaluated, and managed by decision-makers over time.

Our research used a multi-methods approach involving document analysis from primary and secondary sources, semi-structured interviews with key project stakeholders, and a focus group with IA experts. Some 30 interviews were undertaken with key informants who had directed or influenced the social impact evaluation, project management, and/or governance of the projects being considered. Interviews were conducted in Australia and the Netherlands, addressing a range of topics including: strategic project planning and design development; urban governance and project management; EIA, SIA and follow-up; and stakeholder and community engagement. All interviews were conducted in English.

Extensive notes were taken during the interviews and, in most cases, interviews were recorded. Principles of ethical social research were observed (Vanclay et al., 2013), and the project had institutional ethics committee approval from Macquarie University. In the Amsterdam case, interviews were transcribed, while in the Sydney case, the recorded interviews were replayed a number of times, with extensive notes being made. Field diary notes and reflexive memos were also utilised.

A focus group with five IA experts in transport and urban planning was conducted at the May 2018 annual conference of the International Association of Impact Assessment in Durban, South Africa. Discussion questions revolved around understanding the significant social impacts of urban transport, the adequacy and limitations of current ex-ante assessment and adaptive management practices, and the role of IA in improving these practices in urban transport planning. The interview and focus group data were analysed to identify common themes.

The Parramatta Rail Link (PRL) was a heavy rail project planned for Sydney as part of the New South Wales (NSW) Government's 1998 plan, *Action for Transport 2010*. The project was supposed to connect Parramatta in Sydney's Western suburbs to Epping in the rapidly-developing Northern suburbs via new and existing lines and stations. Construction started in 2002. With several changes in ministers and changing economic and operational priorities, it became the Epping to Chatswood Rail Link, and subsequent technical changes have seen the Link become part of the Sydney Metro North West project, which opened in 2019 (Mottee & Howitt, 2018). A desktop review of documentary sources and interviews was conducted in 2016. Semi-structured interviews were undertaken with regulators, politicians, IA practitioners, construction personnel, and representatives from local transport authorities (see Mottee & Howitt, 2018).

The Noord-Zuid MetroLijn (NZL) is an underground metro line that passes under the Amsterdam city centre, connecting the suburb of Amsterdam Zuid to the suburbs north of the River Ij, via Amsterdam's central station. The project was first formally proposed by the Municipality of Amsterdam in its 1968 metro plan (*Stadsspoor)*. The project was completed in July 2018 after a 16-year construction period. Research involved a desktop review of sources in Dutch and English, and semi-structured interviews with municipal and national government representatives, consultants, third party representatives, and aldermen. Interviews were conducted in 2017 and 2018, primarily in person, but also by phone and email.

Assessing the Social Impacts of Urban Transport Infrastructure Development

Identification and management of social impacts should occur throughout the life-cycle of projects (Esteves et al., 2012; Pulido et al., 2018; Vanclay et al., 2015). SIA was formally undertaken for the PRL as part of the EIA (ERMK, 1999). However, an EIA and a SIA were not done for the NZL as it was not a mandatory requirement for a transport project of this sort in The Netherlands.

Building on frameworks from project management (Lessard & Miller, 2013) and SIA (Vanclay et al., 2015), in Table 1 we present the typical eight project stages and how the assessment and management of social impacts should occur in the context of urban transport infrastructure projects. To structure our discussion, we have grouped these eight stages into three phases, which we use to discuss the lessons learned from the two cases: (1) Strategic Planning; (2) Project Planning and Construction; and (3) Operations, Maintenance and Closure.

Phase 1: Strategic Planning

Planned projects are typically first revealed in government plans that are normally linked to policy objectives in the strategic planning phase (refer Table 1, Stage 1). Policies and plans are generally made available for comment, but in this phase the consultation processes typically focus on the intended project outcomes and policy aims, rather than on impacts or alternatives. Financial and political commitment is usually only given in later project stages, once the concept is largely developed (refer Table 2, Phase 2) (Lessard & Miller, 2013).

In Amsterdam, the NZL was proposed as part of the Municipality of Amsterdam's metro plan at a time when Amsterdam was experiencing population growth and high automobile dependency. In Sydney, the NSW Government's 1998 plan, *Action for Transport 2010*, aligned environmental and planning policy objectives with the PRL's objectives to cater for population growth and improve air quality. However, this plan did not result in full financial commitment to the project because, even though the strategic need was established, as a former politician reflected, it was just "a line on a map" without a proper business case (Mottee & Howitt, 2018). Communication around inclusion of the PRL in the *Action for Transport 2010* plan created a misperception amongst the public (including many IA practitioners) that the project would definitely proceed. This misperception, along with the government's failure to construct any new rail transport projects between 1998 and 2010, contributed to a loss of public trust and confidence in the government (Daniels, 2011). There has continued to be pressure on the government to complete the PRL project as originally planned, as the accessibility challenges faced by Sydney's Western Suburbs (as identified in the PRL EIA) have not been adequately addressed by the NSW government's current projects (ERMK 1999; Parraepping, 2018).

Often a considerable amount of time passes before infrastructure projects are realised, during which time the urban environment, demographics and social values will change, making it complex to fully understand the background social setting (Anand et al., 2018). One IA practitioner reflected on this in the Australian context, highlighting there is a need for decision-making to re-evaluate how to manage social change over time:

> we've got roads and transport systems that were planned back in the 1950s that are [only] now heading towards the construction phase, but [in the meantime we have had a] complete change in societal values – and that sounds trite, as though society is a homogenous thing, it's not, of course, it's changing values within the enclaves of the city, with different people with different sets of values – and managing that is the biggest challenge. (Focus Group participant)

Translating policy objectives into actual outcomes from projects is a challenge in urban governance, especially as politicians, parties and policy objectives change over time. The longer the duration between project planning and construction, the more likely the political perspectives and priorities are to change. Reflecting on the potential for delivery of social benefits from transport plans, one focus group participant suggested that flexibility is needed to manage uncertainty about the future environment in planning processes, and argued that plans were made to last for too long. Vanclay

Table 1. The phases, stages and activities in managing social issues in public infrastructure megaprojects.

Phase	Stage	Description in project management (Lessard & Miller, 2013)	Description in SIA (Vanclay et al., 2015)	Key activities
Strategic t Planning	1	Shaping the opportunity	Identifications & Exploration	• Vision and sketches of key dimensions & social political issues & risks about the project • Verbal, informal, but often public, but open to further shaping • Multiple iterations and visioning processes • Published in a strategic government plan and/or transport policy – Social impacts assessed using Strategic Environmental Assessment
	2	Shaping the project	Conceptual	• Options appraisal • Baseline studies & scoping of social impacts & manage social issues • Holistic solutions to interdependent issues in technology, markets and politics • Sponsor, partners and stakeholders negotiate
	3	Reshaping the project	Pre-feasibility	• Risk Assessment, mitigation & enhancement • Concept adapted to stakeholders as they mobilise • Iterations to stress test concept and coalition • Agreement working out consequences of real project & select preferred option
Project Planning & Construction	4	Engineering the Project	Feasibility & Planning	• Multi-dimensional concept is clear & optimised. Detailed business plan and associated costs developed. • Approvals process & technical investigations • Broad set of stakeholders (including political) gives approval to proceed • Detailed plans, including SIMP & contractor performance
	5	Building the project	Construction	• Linear world of project management • Concept is fixed • Contracts set for fast construction to achieve revenue generation • Mitigation, monitoring, audit & regulatory commitments
Operations, Maintenance & Closure	6	Ramping up operations	Operations	• Concept is locked: market, technology and political agreement • Fixed and callable resources are made available • Ownership and financial structure • Mitigation, impact management, monitoring & audit
	7	Maintaining the project *(Additional stage)*	Maintaining the project *(Additional stage)*	• Continued commitment to maintaining the project • Operational plans & monitoring e.g. noise and vibration • Concept is built, little if any modification is possible without creating a new opportunity. • Maintaining relationships with operator, looking for opportunities for improvement
	8	Decommissioning (with or without replacement) *(Additional stage)*	Closure	• Opportunity for improvement or technology upgrade e.g. switch to autonomous vehicles • End of asset life • SIA of closure options

et al. (2015) suggested that commencing SIA early in strategic planning (see Table 1), rather than in project planning, may help to address this uncertainty by identifying social risks ex-ante. Managing uncertainty occurs in later phases through adaptive management, especially in relation to anticipated social changes (Franks & Vanclay, 2013).

In The Netherlands, local landuse plans (*Bestemmingsplannen*) are a formal expression of municipal intent to construct large projects, and they designate locations for future infrastructure. In NSW, designated State Environmental Planning Policies and Local Environmental Plans are intended to perform similar functions, however the *Action for Transport 2010* plan did not have the standing of these planning instruments (at least initially). Public participation processes in NSW and the Netherlands provide opportunities to consider how plans for infrastructure will affect the public and integrate with existing land uses. In the Netherlands, participatory planning implies that citizens should be included in plan-making processes, and is closely related to the democratic rights of citizens (Woltjer, 2002). This participation occurs separately to the EIA process as part of urban planning. While consultation is formally required, it would not normally be considered community engagement because there is no requirement to actually modify the project, as one of the citizens impacted by the NZL reflected:

> But, when most of the time governments come with plans, the plan is already ready. They say "What do you think of our plan?" And people say, "Hmm, couldn't you change this? Why did you do it this way? Or, couldn't you do this?" They say, "Yeah okay, we've already discussed that and we cannot change it anymore". So we think, "So why then do you ask us?" (Citizens' Representative Interview)

This citizen's reflection suggests that there was an underlying mistrust amongst the public in the Municipality of Amsterdam, and a lack of public influence in decision-making. Further, the quote implies that social needs are not given due consideration early enough in strategic planning and plan-making (that is, Phase 1, Stage 4), prior to when a concept becomes fixed and can no longer be changed (that is, Phase 2, Stage 5) (refer Table 1). However, as we have identified, the greatest potential for the creation of opportunities and consideration of alternatives to benefit local communities, and in building trust, is to conduct strategic and pre-feasibility assessments early in the planning process (Gagnon et al., 1993; Miller & Buys, 2012).

The focus group participants considered the role of IA to be shaping and reshaping the project (Table 1), facilitating integrated assessment of key issues, mitigating impacts, and providing a systematic way to include all stakeholder groups. While various social impacts can be identified in the early stages of transport planning, the limited ability of the assessment to deal with ill-defined project plans, the dynamics of urban society, and the complexities of infrastructure megaprojects, necessitates monitoring across the whole project life-cycle (Morrison-Saunders & Arts, 2004; Vanclay, 2017b). As one focus group member reflected:

> There is always a time or cost limit to how much evaluation you can do before you make a decision. As an industry we have struggled at times to evaluate [i.e. assess] complex environments and quantify potential consequences. Our belief that we can control societal issues, environmental issues has proven again and again that we underestimate the complexity [of urban systems]. (Focus Group participant)

The participant identified an issue for SIA and EIA practice, which planning practice has sought to address through adaptive management concepts and EIA follow-up (Morrison-Saunders & Arts, 2004). However, this expectation of adaptive management and follow-up demands more government regulation that requires EIA follow-up and good project management that continuously engages with a wide range of stakeholders (Arts & Faith-Ell, 2012; Priemus & Van Wee, 2013; Vanclay et al., 2015).

Phase 2: Project Planning & Construction

In this phase, transport infrastructure moves from a policy vision to a confirmed project, and the business case is finalised (see Table 1). Various assessments are undertaken during this phase to assess various environmental, social and urban planning issues. The environmental planning legislation in the particular jurisdiction determines whether, and to what extent, social impacts are considered. Overly-prescriptive requirements can result in a narrow focus in the assessments, diminishing the potential role of SIA to identify all impacts and opportunities, and may lead to pre-defined outcomes (Howitt, 1993). As one IA practitioner noted, IA has the potential to have a greater role in informing decision-making only when good practice is applied that considers a wide range of issues:

> If IA is taken in a narrow, legalised, formalised way, then it's just justifying or validating the preferred plan for the transport [project], and mitigating it, and putting in place the management systems. But if IA is considered as the big picture of thinking before the action, then its role [in decision-making and urban planning] can be absolutely everything. (Focus Group participant)

At the time of the NZL, Dutch law provided that an EIA was only required for an underground railway if it was at least 5 kilometres in length and outside a built environment, or in an environmentally-sensitive area. Therefore, an EIA was not undertaken for the NZL. By contrast, at the time the PRL was being assessed, NSW Planning law required an EIA, but did not stipulate a detailed SIA beyond that specified in the EIA report – noting that the definition of the environment in Australia typically requires some consideration of social issues (Mottee & Howitt, 2018; Vanclay, 2004). The absence of strict legal requirements for a SIA meant that the assessment of social impacts was not done according to international good practice. For the NZL, a government representative noted that a project risk management approach was adopted, in which some environmental and social impacts were considered. For example, the management strategy to address some social impacts that were identified as risks in the project risk management approach was to compensate stakeholders for the disruption they experienced during construction.

As much discussed in the literature, stakeholder engagement is an essential part of EIA, SIA and urban planning processes, including in Australia and the Netherlands, and is usually a regulatory requirement everywhere (Gagnon et al., 1993; Hartley & Wood, 2005; Legacy et al., 2017; O'Faircheallaigh, 2010; Stolp et al., 2002). Research participants, however, suggested that it is often done too late in the project life-cycle (Mottee & Howitt, 2018). Our participants suggested that community engagement to identify potential social impacts, to determine management strategies, and to influence the project's social licence to operate, should occur early in the shaping of a project.

For the PRL, consultation prior to the EIA was limited. Consequently, community values were over-looked in comparison to technical and economic reasoning. This over-looking of community values meant that later, when there was consultation as part of the EIA, it became obvious that a re-design of the project was demanded by the public (Mottee & Howitt, 2018, p. 6):

> There was a lot of worry from the community about visual impacts [that was not anticipated by the Department of Transport] … so, once the momentum got going [opposing the preferred bridge alternative through a national park] … they [the public] were able to mount an argument that was unable to be countered by the EIS [Environmental Impact Statement] or the evaluation that Department of Planning did. So the route had to be changed. (ESIA Practitioner Interview)

Early application of SIA and community engagement would have prevented this discrepancy between actual project plan and community desire, and would have reduced the costs of wasted detail planning. During the early construction phases of the NZL, community liaison staff identified

that the Municipality's failure to adequately communicate with the public about technical risks, led to a weakening of the NZL's social licence to operate over time. When a technical incident that damaged homes along the Vijzelgracht occurred in 2008, this led to the project being halted, and to a year-long investigation (the Veerman Committee) being initiated, as well as the complete loss of social licence for the project. Following the Veerman Committee's report, a formal stakeholder communication strategy was developed and funded to engage with the community in a more transparent manner, and to prioritise community needs in the management of project impacts (Schuurman & Sheerazi, 2013). Although the NZL project team believed that the strategy improved rapport with local people, and that they had undertaken good practice consultation, it was reactive in response to the incident. Had SIA been applied preventatively from the beginning of the project, the potential social impacts and risks would have been identified earlier and communication improved. There would have been a better understanding of the community's needs and desires, and public support for the project would have been greater.

To improve the project's reputation, the NZL communication strategy deliberately focussed on the temporary short-term impacts during construction, rather than on the long-term social impacts or needs, such as distributional effects on marginalised groups, or inequality and wellbeing in neighbourhoods, which are critical issues to consider (Jones & Lucas, 2012; Vanclay, 2002). A monitoring plan, which may have helped identify and manage the long-term social impacts of the project, was never established.

During the design process, technical modelled approaches can provide opportunities to consider social dimensions, using parameters such as accessibility and mobility, or measurements of overall sustainability or transport justice (Banister, 2008; Martens, 2017). However, because the decision about the public need for the NZL had been made many years earlier in the metro plan [*Stadsspoor*], technical planning for the NZL only focused on geotechnical risks and construction challenges, rather than on social benefits or impacts. As one government representative noted:

> From the beginning, it was a very technical project, because it was something that was never done before in this soft soil of Amsterdam. Everything was focussed on safety and technical possibilities: can it be made?, can it be constructed?, is it safe to construct in such a densely-populated area? How can we keep the city accessible and functioning while construction is occurring? Nobody ever wondered whether the people around it get enough sleep, or if children living there would be happy – that wasn't part of the [thinking about the] project. (Government representative Interview)

A former NZL government representative reflected on how this technical focus overshadowed consideration of social issues in project decision-making, contributing to the loss of social licence to operate. In the focus group, there was consensus that technical engineering approaches to transport planning contribute to the inadequate assessment of social effects and their inequitable distribution in society:

> They are physical engineers, they think about transport from the physical perspective … they do look into needs and demands, because they need to have a market for what they are going to be proposing, but that's the extent to which they consider [social issues]. They look into mobility, accessibility, all of that, but from the perspective of the infrastructure … Planning tends to be, especially in mobility and transportation, very, very technical, so in planning processes, in the end, some of the groups will benefit, and we have to concentrate on the groups that do not benefit. Some of them will clearly lose, that's a fact. (Focus Group participant)

This reflection supports the findings of Bertolini (2012), Geurs et al. (2009), Jones and Lucas (2012), Martens (2017) and others, who indicate that much more work is still needed within transport

planning practice to ensure that social and distributional issues are more fairly assessed and considered, using appropriate, qualitative methods, such as applied in SIA (Schwanen et al., 2015). The same focus group participant added:

> what's important is that huge infrastructure, especially city linear projects, will create lots of intermediate states, here is also where the demon lies. It's a long multi-stage process and there will be 10 years of building time. I don't think that transport engineers really give too much thought to the specific aspects of social needs … I don't believe the decision-making process within these departments is wide enough, that there is enough players in the critical decision group, it does tend to get dominated by a few people who want the large concrete entity between A and B [to be built as quickly as possible]. (Focus Group participant)

The temporal complexity discussed by this focus group participant (i.e. the long multi-stage process of infrastructure decision-making and poor evaluation of changing social needs by transport engineers) highlights the limitations of technical approaches in planning practice. As advocated by Jones and Lucas (2012) and Stanley and Vella-Brodrick (2009), our focus group participant was calling for a more integrated people-centred approach to transport decision-making, based around social need.

Phase 3: Operations, Maintenance and Closure

In this phase, the project moves into operation and ongoing maintenance for the duration of its life, and later to prepare for decommissioning and closure (refer Table 1, Phase 3). Even though public infrastructure is intended to be long-lasting, due maintenance is required on a regular basis. This maintenance ensures reliability and safety, as well as, in some cases, compliance with permitting requirements (Pulido et al., 2018).

Operational monitoring during this phase may occur in addition to the follow-up of mitigation measures proposed in an EIA or SIA. For example, the approval conditions for the PRL required a report to be produced 7 years after project completion to, *inter alia*, indicate noise and vibration effects. The NZL began operations in July 2018 and is only now moving into a maintenance phase. As there was no EIA that may have nominated operational management strategies, monitoring is being undertaken according to the operator's schedule and the Municipality of Amsterdam's permit requirements. In cooperation with a number of universities, a four-year program of evaluation began in 2017 to capture the impact of the project on mobility patterns and behaviour, quality of life, socio-economic and spatial aspects (Vervoereggio Amsterdam, 2019). In our opinion, while this evaluation methodology reflects some elements of good practice, SIA should have been undertaken much earlier to collect baseline data for evaluation and ongoing management of social issues.

Over time, infrastructure may become redundant or require repairs or replacement. Because social needs change over time, replacement and renewal should be an opportunity to reshape the project. Thus, the project reverts to Phase 1 in our model (refer Table 1). Reshaping the project should lead to a project review, a re-assessment of social and environmental effects, and further public consultation (Morrison-Saunders & Arts, 2004; Vanclay et al., 2015). For example, when the PRL was modified (shortened) to become the Epping to Chatswood Rail Link, another EIA was undertaken. However, modification of the PRL project for technical and economic reasons resulted in reduced social benefit (less accessibility for Sydney's Western Suburbs) and a less equitable social outcome. This reduction in benefit was not captured in the second EIA (with its narrow project focus on the Epping to Chatswood Rail Link) and would have required a reconsideration of the project's strategic policy aims (refer Table 1, Stage 1) (Mottee & Howitt, 2018).

An infrastructure asset will eventually reach the end of its useful life. To assess the effects and strategies to manage the social impacts of removal, an SIA should be conducted whenever infrastructure is closed (refer Table 1, Stage 8) (Esteves & Vanclay, 2009; Vanclay et al., 2015).

Conclusion

The field of transport planning abounds with literature on the need to focus on the social dimensions of transport in urban planning, and advocates a shift away from technical models to more deliberative and qualitative methods. We endorse this shift, and have made suggestions as to how to reconceptualise social issues in transport by applying conceptual thinking about social impacts drawn from SIA (Howitt, 2011; Vanclay, 2002). However, our research indicates that current transport planning practice is slow to adopt this shift and continues to be dominated by a focus on technical and economic concerns (Esteves et al., 2012; Vanclay, 2017b).

Using Amsterdam's North-South Metro line and Sydney's Parramatta Rail Link as examples, and by drawing on wider discussions with IA practitioners, we drew attention to the limitations of technical approaches to transport planning and the need for the improved assessment and management of social impacts. A key finding is that the needs of affected communities are too-easily overlooked in technical approaches and are, therefore, inadequately considered. In the two examples we discussed, the narrow technical approach applied clearly contributed to a loss of social licence to operate, to poor communication, and to a failure to use appropriate management strategies to protect affected people. This finding strengthens the call for action within transport planning (Jones & Lucas, 2012) – that interdisciplinary and cross-sector solutions are urgently needed.

The SIA field of practice offers constructive guidance to inform transport planning practice (Pulido et al., 2018; Vanclay, 2017b; Vanclay et al., 2015). The widely-advocated benefits of SIA have been demonstrated to reduce project delays, cost over-runs, enhance project outcomes, improve public participation in decision-making, and strengthen the social licence to operate of projects (Esteves et al., 2012; Jijelava & Vanclay, 2018; Vanclay, 2017a). Governments have developed their own guidelines for SIA (see Parsons, Everingham, & Kemp, 2019), even in the absence of requirements mandating them.

We suggest that SIA can play a valuable role in transport planning practice by addressing the limitations of modelling approaches. SIA thinking, if applied in the early shaping stages of projects, provides opportunities for deeper community engagement, to understand how social change processes impact communities, and to develop effective mitigation strategies. However, this requires that SIA practitioners have a greater role in the early stages of project planning and that their advice is influential in project design and decision-making.

Urban regulatory frameworks and the established processes for decision-making, financing and planning of infrastructure, all influence when and how social impacts are considered in project lifecycles, and at what governance and geographical scales. In infrastructure megaprojects, the management of uncertainty, changing political terms, lengthy planning timeframes, the adequacy of budgets, and capacity, all have a substantial influence on project success (Mottee & Howitt, 2018). While we recognise that public consultation occurs within governance and decision-making processes, our research suggests that typically it comes too late in the project lifecycle, and that insights from consultation do not necessarily get transferred into the assessment and management of social issues. The politics of infrastructure development in shaping cities often dilute the capacity of the public to contribute meaningfully to transport planning (Haughton & McManus, 2019). As our case results show, the failure to meet the expectations of and commitments made to affected groups leads to a loss of social licence.

For SIA to be effective, we suggest that it should be mandatory and embedded within integrated urban spatial planning processes (Heeres et al., 2012; OECD, 2010; Pulido et al., 2018). Integrated urban spatial planning encourages the assessment of project impacts and assessment of social issues in cities in an integrated way. In such an integrated approach to planning, social impacts would be considered during policy development and strategic planning, thus preceding regulatory project-based IA. Where SIA is not mandatory, there are risks of limited public benefit arising from infrastructure projects, lack of a project social licence to operate, and failure to achieve policy objectives. Where technical approaches continue to dominate transport planning practice, there is a missed opportunity to explicitly address distributional equity and social impacts as critical concepts of urban planning theory.

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